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Jean W. Adams
Iowa State University

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Abstract
Recent studies of physician pricing have pointed to the difficulty of developing a satisfactory theory of physician price determination. Wliile much thought has been given to the various special characteristics of the market for medical services (for example, see references 2, 5, 8, 9, 11, and 12), no single theory incorporates all the implications of such char acteristics. In addition, much of the limited empirical work on physician pricing fails to either support or reject proposed models having a priori appeal. For example, Newhouse constructed monopolistic and competitive models of physician pricing and attempted to demonstrate that his empirical results support the hypothesis that the market for physicians' services is monopolistic [13]. However, in a comment on the Newhouse study, Freeh and Ginsberg demonstrated that Newhouse's empirical findings could not distinguish between monopolistic and competitive pricing under standard profit maximization assumptions [6].

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I INTRODUCTION

Recent studies of physician pricing have pointed to the difficulty of developing a satisfactory theory of physician price determination. While much thought has been given to the various special characteristics of the market for medical services (for example, see references 2, 5, 8, 9, 11, and 12), no single theory incorporates all the implications of such characteristics. In addition, much of the limited empirical work on physician pricing fails to either support or reject proposed models having a priori appeal. For example, Newhouse constructed monopolistic and competitive models of physician pricing and attempted to demonstrate that his empirical results support the hypothesis that the market for physicians' services is monopolistic [13]. However, in a comment on the Newhouse study, Frech and Ginsberg demonstrated that Newhouse's empirical findings could not distinguish between monopolistic and competitive pricing under standard profit-maximization assumptions [6].

In a 1974 article, Steinwald and Sloan attempted to use the empirical results of a study of the determinants of physician fees to provide some insight into the appropriateness of various theories of physician pricing [14]. Included among the theories considered were: competitive and monopoly profit maximization; utility maximization; pricing to achieve a target income; non-price rationing (i.e., pricing to maintain permanent excess demand in order to allow physicians some discretion to select the most medically interesting cases); and markup pricing. The empirical results lead to tentative rejection of the models of markup pricing and non-price rationing and indicate that the target-income model may also be less appropriate than some previous studies suggested. The authors conclude by supporting continued usage of "standard" profit-maximization models [14, 510-511].

This paper seeks to provide additional understanding of the nature of physician pricing through statistical analysis of the determinants of cross-sectional variation in the pricing of physicians' services. The data employed was obtained from the Center for Health Services Research and Development of the American Medical Association. The 1969 5th Periodic Survey of Physicians is a cross-sectional survey of individual physicians for 1968-1969. Using a set of computer-generated random numbers, 7563 physicians were randomly selected for the 5th Periodic Survey from the AMA's Masterfile of Physicians, which contains information on all physicians practicing or residing in the United States. The usable number of responses was 4689 physicians (or 62% of the original sample).[1] The data set included individual physician pricing data on fourteen different procedures, all of which are relatively standard medical procedures that can be performed by any licensed physician. Two of these were selected, namely, the obstetrical care[2] and the appendectomy procedures.[3] From the 4689 physicians included in the data set, those physicians who performed either or both of the two procedures were selected. The resulting sample size was 713 physicians for the obstetrical care procedure and 726 physicians for the appendectomy procedure. Data on two additional variables was added to the AMA data set; population per physician by county size was obtained from Reference Data on the Profile of Medical Practice [3, 90] and state per capita income was obtained from the "1969 Survey of Buying Power" [15, c-12-c-122].

The following section discusses the nature of the model used, specific hypotheses concerning the determinants of physician pricing, and descriptions of the variables employed. Section III presents and discusses the empirical results, and the final section summarizes the insights gained by the statistical analysis.

II MODEL, HYPOTHESES AND VARIABLE MEASUREMENT

The characteristics of the market for physicians' services preclude application of both the model of perfect competition and that of pure monopoly; instead, a model of imperfect competition is appropriate. As Fuchs and Kramer point out,

> "With respect to physicians' services, the imperfections of competition are numerous and powerful. On the supply side, these include the restrictions on entry created by licensure and professional control of medical education, the limitations on practice implicit in the hospital appointment system, and the absence of price cutting, advertising, and other forms of rivalry. As for demand, the difficulty consumers experience in judging the quality of physicians' services is well known, and it is thought by some that the physician plays a major role in determining the quantity of services to be provided" [7, 1].

The model of physician pricing used in this study assumes that each physician faces a downward sloping demand curve for his services, thereby providing the physician some monopolistic ability to set price and quantity. Multiple linear regression analysis is used to establish the significance of a wide range of variables hypothesized to influence the price a physician charges for his services. The independent variables are grouped into four categories: physician characteristics, demographic characteristics, structural characteristics, and costs of producing medical care. The dependent variable used for each medical procedure is the average price a physician charges a patient of middle income in the absence of complications.[4]

A. Physician Characteristics

1. Degree of specialization

The degree of specialization of the physician is hypothesized to have a positive effect on price, since the more specialized a physician is, the higher the quality of service he should be capable of rendering

to his patients, especially in the provision of those procedures that are included in his specialty.

The 5th Periodic Survey of Physicians requested that each physician indicate the specialty area of medicine from which he derives 50% or more of his medical income. With the use of dummy variables each physician in the samples was classified according to whether he is a general practitioner, a specialist in the specialty field of medicine that is most closely identified with the procedure in question, or a specialist in another specialty. For both procedures studied, the base for the dummy variables measuring specialization is general practice. The coefficient for "primary specialty" (PSP) indicates the fee difference between general practitioners and those physicians who received 50% or more of their medical income from the specialty that typically performs the procedure in question. For the obstetrical care procedure, the relevant primary specialty is Obstetrics and Gynecology; for the appendectomy procedure, Surgery was selected as the relevant primary specialty. The coefficient of the second specialty dummy variable, "other specialty" (OSP) indicates the price difference between general practitioners and physicians who are specialists in a specialty other than that chosen as the relevant primary specialty.

Thus, a positive relationship is expected between primary specialty (PSP) and price and between other specialty (OSP) and price. In addition, it is hypothesized that the size of the coefficient of PSP will be larger than that of OSP; this follows from the assumption that a specialist performing a procedure that is not included in his specialty will produce (or at least will be perceived by patients as

producing) a service of lower quality than the relevant specialist who is better trained to perform the procedure in question.[5]

2. Years of experience

A priori it is impossible to predict the direction of the net effect of years of experience on the quality of services provided and thus on price. On the one hand, years of experience should have a positive effect on price in that the quality of a good or service is assumed to increase as the producer becomes more experienced. Steinwald and Sloan have also suggested that older physicians may have increased preferences for leisure; consequently, they may charge higher prices to encourage a reduction in their numbers of patients [14, 501]. Another potential cause of a positive relationship between years of experience and price is the possibility that newly licensed physicians will charge relatively low fees in order to attract patients [14, 500]. On the other hand, it may be that rapid advancements in medical technology and procedures result in a relatively inexperienced physician producing a higher quality of medical care because he has acquired new medical knowledge that the more experienced physician is unaware of.[6]

The following three alternative measures of years of experience were tested for statistical significance:

YRS_1--years since graduation (from medical school)

YRS_2--years in specialty

YRS_3--years in specialty, excluding residency

3. Physician sex

It is hypothesized that women physicians may be discriminated against by patients seeking medical care. If, ceteris paribus, patients prefer male to female physicians,[7] this will be revealed in the model by the

existence of different demand curves for male and female physicians, with the patient demand curves for the services of female physicians being positioned to the left of the demand curves for male physicians. In such a situation, the influence of physician sex on price depends on the relative elasticities of demand and marginal costs for male and female physicians. Since no theoretical reason nor empirically-based information exists to hypothesize otherwise, it is assumed that (1) the marginal cost of providing medical care is constant and equal for male and female physicians, and (2) the elasticity of demand is the same for male and female physicians. Using these assumptions, the model implies that patient preferences for male physicians will be reflected by female physicians receiving lower prices than do male physicians.

A dummy variable (SX) having a value of 1 for female physicians and 0 for male physicians is utilized to test the effect on price of the sex of the physician. Thus, the hypothesis is that the coefficient of SX will be negative, indicating that, ceteris paribus, women receive lower fees than do male physicians. In addition, the size of the fee differential can be used as an indication of the extent of discrimination against women physicians.

B. Demographic Characteristics

The demographic factors included in the empirical investigation are per capita income, population per physician and the degree of urbanization; all three are with respect to the geographic area in which the physician practices medicine. These demographic factors primarily reflect the demand side of the market for the services of physicians and can be interpreted as causing shifts in the demand curves facing the individual physicians. However, they may be considered to be supply determinants as well, in that physicians may choose

the geographic locations of their practices in response to such demographic factors.

1. Per capita income

The per capita income of the area in which a physician practices is hypothesized to have a positive effect on the price of the physician's services for two reasons. The first reason follows from the inclusion of income as one of the determinants of an individual's demand curve for the services of a physician; a higher level of income, ceteris paribus, is hypothesized to cause an outward shift in the individual's demand curve. When aggregating such demand curves over individuals, a higher level of per capita income of the geographic area is expected to likewise shift outward the demand curve for the services of each individual physician, thus resulting in higher prices being charged in that geographic area as compared to regions with lower per capita incomes. A second related cause for the hypothesized positive relationship between per capita income and price is the deliberate use of price discrimination, in the sense that physicians may determine the price to charge patients by the criterion of ability-to-pay.[8] Thus, higher prices are expected in those areas that have higher per capita incomes than in geographic areas with lower per capita incomes.

State per capita income (INC) is employed as a measure of per capita income of the geographic area in which the physician practices. A smaller geographic area than states was preferrable; in particular, the county or city in which the physician practices were preferred geographic divisions. However, the AMA data set identified physicians only by state, thereby necessitating the use of the imperfect state per capita income measure.

2. Population per physician

In the absence of excess demand, population per physician is also hypothesized to have a positive effect on physicians' prices since an increase in population per physician is predicted to shift outward the demand curve facing a physician. With a larger population per physician, one is aggregating over a larger number of potential patients to determine the demand curve for the physician under consideration. However, if excess demand for the services of physicians prevails in all the geographic areas under consideration, the areas associated with higher population per physician ratios may not be characterized by higher physician prices. Therefore, if such excess demand is typical, one does not expect population per physician to have a significant effect on prices charged.

As mentioned above, the AMA data set does not identify physicians by specific county or city of practice; rather, physicians are classified into nine categories according to county population.[9] Also not included in the AMA data set is population per physician. However, a rough measure of population per physician was obtained by combining the county size group codes with information from another AMA source that presented population per physician by the same nine categories of county size group codes [3, 90]. Thus, the variable used, P/P, is the average population per physician of all counties having the same county size group code classification as that county in which the physician practices.

3. Degree of urbanization

The degree of urbanization of the area in which a physician practices is hypothesized to have a positive effect on price. This explanatory variable is a proxy measure for those factors that differ depending

on where a physician is located along the continuum ranging from rural to urban. For example, the degree of urbanization may be an appropriate proxy measurement of the cost of living in the area in which a physician practices. But this variable may also reflect the combined effects of other factors that may consistently differ according to the degree of urbanization, such as population per physician, per capita income and non-physician complementary costs of producing medical care.

The population of the county in which the physician practices medicine is used as a proxy for the degree of urbanization. Two dummy variables are used to test the effect on price. The base for both such dummy variables is a county population of less than 50,000. The coefficient of the medium-sized geographic area (MED) indicates the price difference between physicians in the base-sized geographic area and physicians who practice medicine in counties with populations in the range of 50,000 to 1,000,000. Similarly, the coefficient of the large-sized geographic area (LG) indicates the price difference between physicians in the base-sized geographic area and physicians who practice medicine in counties with populations greater than 1,000,000.

C. Structural Characteristics of the Production Unit

Two variables that together partially describe the structure of the unit in which the physician produces his services are source of income and type of practice.

1. Source of professional income

Source of professional income refers to the basis on which a physician receives his income. Specifically, it refers to whether he is paid for the services he performs on a salary basis or on a fee-for-service basis or some combination of the two.

Organized medicine has promoted the use of the fee-for-service principle and has argued that only such an income principle will maintain a high quality of service. However, the real impetus for preferring fee-for-service over salary arrangements may be to maintain the high level of prices for physician services. When the fee-for-service basis is used, the physician's income is more directly related to the prices charged patients and the physician has a greater personal incentive to control the use of such pricing policies as price discrimination. One can tentatively hypothesize that the more a physician gets away from the use of straight fee-for-service, the lower will be the price charged.

The AMA data set categorizes physicians according to their relative usage of the fee-for-service principle as the basis for determining physician income. Fee-for-service only is the base used for the following three dummy variables that measure the source of professional income:

F/S - fee-for-service primarily, but some salary

S/F - salary primarily, but some fee-for-service

S - salary only

Thus, to lend support to the AMA's traditional argument for usage of the fee-for-service principle, the empirical results should show that each of the above three dummy variables has a negative effect on price and that the absolute value of the coefficient of each successive variable is larger than the previous one, as compared to the base of fee-for-service only.

2. Type of practice

Type of practice refers to which of the following categories of practice the physician is engaged in: solo practice, partnership, informal association or group practice.

The net effect on price of the type of practice the physician is engaged in cannot be hypothesized a priori because two effects may theoretically result that influence price in opposing directions. On the one hand, the larger the practice a physician is associated with, the greater are the opportunities for realization of economies of scale in the production of medical care. Such increased economies of scale are graphically revealed by downward shifts in the cost and supply curves thus inducing the potential for a decrease in costs and prices. On the other hand, larger combinations of physicians may be expected to allow more specialization by each physician (even within a specialty field of medicine), thereby raising the quality of each physician's services and thus inducing an increase in price.

Dummy variables are used to measure the effect of type of practice on prices. Solo practice was selected as the base. Variable PRT (partnership) measures the effect on price of a physician practicing in a partnership with another physician as compared to being engaged in solo practice. Variable GRP (group practice) similarly measures the effect on price of a physician being a member of a group practice as compared to being engaged in solo practice.

D. Costs of Producing Medical Care

The cost of producing medical care is hypothesized to have a positive effect on physician's prices by shifting the physician's cost curves upward. Unless there is wide variation among physicians in the number of patients seen annually, different total expenses imply different average costs per patient. The hypothesized positive relationship between costs and physician fees is expected to hold for each of the components of the cost of providing medical services as well as for its aggregate.

To test the significance of costs, a measure of total yearly expenses (EXP) is employed which includes those expenses (measured in units of $1000) that are allowable business deductions for federal income tax purposes. In addition, tests of the hypothesized positive relationship between prices and costs are conducted for a variety of the components of total expenses. These cost components (measured in dollars) are as follows:

W & S - employees' wages and salaries

RNT - rent

UTL - utilities

MAL - malpractice insurance

INS - other insurance (related to medical practice)

CAR - professional car

EQP - purchase, rental or lease of equipment

SER - non-medical professional services (legal, accounting, etc.)

SUP - drugs and medical supplies

III RESULTS

The process of selecting variables for inclusion in each price equation began by including in the initial equations for each procedure as many of the variables expected to influence price as was possible. No tested equation included all the independent variables discussed above for the following two reasons. First, the amended data set included two or more alternative variables measuring several factors expected to affect price; for example, variables YRS_1, YRS_2 and YRS_3 are all measures of the degree of experience of the physician. Because of the expected high correlation between such variables, inclusion of only one of the three at a time was appropriate to avoid multicollinearity.[10] The second limitation is likely to be more serious. Many of the physicians in the data set failed to provide information on all the

variables included in this analysis. In an attempt to employ large numbers of observations on all the variables tested, each regression equation includes only those physicians who provided data on all the variables to be included in the particular regression; excluded from each price equation were those observations for which data was missing for any variable or variables included in that equation. It is possible that this selection method biased the results obtained; however, the same variables that were significant in one sample of physicians for a given procedure were generally of the same sign and degree of significance in equations employing somewhat different samples of physicians. Thus, the results do not appear sensitive to the different subsamples of physicians.

After reviewing the results of the initial regressions, the empirical investigation proceeded by including in subsequent price equations those variables that were statistically significant or approached such significance in the initial regressions. Thus, the regression equations in Table 3 include only those variables that were statistically significant price determinants for at least one of the two procedures tested. Tables 1 and 2 respectively present the means and standard deviations and the correlation matrices for these variables.

[INSERT TABLES 1 AND 2 HERE]

The statistically significant determinants of physicians' fees for the two procedures are especially easy to compare since the means of the prices of the two procedures are very close; the mean fee for the appendectomy procedure is $198.04, while the mean for the obstetrical care procedure is $199.50.

[INSERT TABLE 3 HERE]

The equations explain between 28 and 30 percent of the variance in fees for the appendectomy procedure and between 54 and 57 percent of the variance for the obstetrical care procedure. These $\bar{R}^2$s are reasonable high, given that the data is cross-sectional. In general, the results indicate that the explanatory variable categories of physician characteristics, demographic characteristics and costs of producing medical care are more significant determinants of physician fees than are the structural characteristics of the physician's practice.

A. Physician Characteristics

1. Degree of specialization

Variables PSP and OSP are the two dummy variables that measure the physician's degree of specialization. For the obstetrical care procedure, the coefficients of PSP (primary specialty) indicate that a physician who specializes in Obstetrics and Gynecology receives approximately $63 more than does a general practitioner. Similarly, a physician specializing in Surgery receives approximately $18 more for performing an appendectomy than does a general practitioner. For both procedures the physicians primary specialty (PSP) was always positive as hypothesized and statistically significant at the 99% level. However, primary specialty has a more substantial effect on price (more than three times the dollar amount) for the obstetrical care procedure than for the appendectomy procedure. This may be due to the nature of the procedures themselves. Surely patients requiring the obstetrical care procedure have a good indication of the cause of their medical problem (namely, pregnancy) at the time they select a physician; it should be obvious to the patient which type of specialist performs the warranted medical services. However, this is not likely to be the common situation with respect to the appendectomy

procedure, in which case the early symptoms do not provide the patient a clear indication of what specialty of physician is most appropriate. As a result, obstetricians and gynecologists may have a larger degree of monopoly power with respect to the obstetrical care procedure than do surgeons with respect to the appendectomy procedure.

The empirical results for OSP (other specialty) are somewhat mixed. As hypothesized, the sign of OSP was always positive and the magnitude of the coefficient of OSP was less than that of PSP; however, while OSP was typically statistically significant at the 95% level in the obstetrical care equations, it was not a significant determinant of the appendectomy fee.

2. Years of experience

As discussed earlier, the three highly correlated measures of the physician's length of experience were tested separately. The three measures were YRS_1 (years since graduation from medical school), YRS_2 (years in specialty), and YRS_3 (years in specialty, excluding residency). In the price equations for both procedures tested, none of the three measures of experience was ever statistically significant, not even at the 90% level, and the signs of the coefficients varied in no systematic pattern. Such non-significant results are not surprising since, as discussed previously, the amount of experience possessed by a physician may lead to several effects that influence price in opposing directions. The Steinwald and Sloan study (using similar AMA data for 1970-71) included three dummy variables measuring the age and/or experience of the physician and also found the signs of the coefficients to vary and to seldom attain statistical significance [14, 506-507].

3. Physician sex

The hypothesized existence of sex descrimination on the part of patients in selecting physicians and the resulting negative effect on fee received by female physicians is supported by the statistical results obtained in the regression equations for both procedures tested. Ceteris paribus, being a woman physician reduces the fee received for an appendectomy by more than $53. For the appendectomy procedure, the sex variable has the largest coefficient of any of the independent variables and is statistically significant at the 99% level. Being a woman physician also reduces the price charged for the obstetrical care procedure; however, the size of the sex coefficient is substantially smaller (approximately $15) than it is in the appendectomy regression equation and is statistically significant at only the 90% level.[11]

B. Demographic Characteristics

1. Per capita income

For both procedures tested the coefficient of INC (which measures the per capita income of the state in which the physician practices) was always positive as hypothesized and statistically significant at the 99% level. While the values of the coefficients of INC are small (.02 for obstetrical care and .03 for appendectomy), the statistical results provide empirical support for the hypothesis that there exists geographic price discrimination in the sense that physicians charge higher prices in those geographic areas that are characterized by higher levels of income.

2. Population per physician

Before considering the results obtained for this variable, the reader should be reminded that population per physician was measured

quite imprecisely. Variable P/P is the average population per physician of all counties having the same county size group code classification as the county in which the physician practices. Using such a rough measure of population per physician may be at least partially responsible for the results obtained.

In all regression equations that included P/P, the coefficient was always negative and statistically significant at the 99% level. As discussed earlier, theory predicts that, in the absence of excess demand, the sign will be positive; however, if excess demand prevails, population per physician is not expected to have a significant effect on price. The only theory consistent with the negative and significant coefficients obtained is that physicians price in order to achieve a target income.

Because P/P is based on county size group codes, the negative correlation coefficients between P/P and LG are relatively high (see Table 2), due to this, the regression equations presented in Table 3 include equations where P/P and the two variables measuring the degree of urbanization (MED and LG) were used separately as well as together. While the coefficients of P/P varied somewhat, the direction and degree of statistical significance of P/P remained the same.

One might be tempted to discount the results obtained for the population per physician variable due to the poor measure used. However, it should be noted that Newhouse found the same unexpected sign; a partial correlation coefficient of +.55 was found between the number of physicians per person and price charged for office visits by general practitioners [13, 178].[12] In their study of the determinants of physicians' fees, Steinwald and Sloan claimed that "the use of gross measures of physician supply does not permit distinguishing among

varying degrees of substitutability of services of physicians in different specialties" [14, 501]. As a result, they tested the influence on physician fees of two measures of relative physician supply in the physician's geographic area: MDPOP1 is the number of physicians in the physician's field per 1000 population; MDPOP2 is the number of physicians in other fields per 1000 population. A priori, they hypothesized that the with-in field cross-elasticity of demand (MDPOP1) would be higher than the between-field cross-elasticity (MDPOP2). However, the results were inconclusive with the signs and degree of statistical significance varying greatly for both measures of relative physician supply [14, 506-507].

3. Degree of urbanization

Because the same nine county size group code variables were used to construct both the two dummy variables measuring the degree of urbanization and the population per physician variable, the regression results presented in Table 3 include equations containing both these constructed variables (equations 3), as well as equations containing only one of these constructed variables (equations 1 and 2). Where MED and LG are included and P/P is excluded, both procedures reveal the degree of urbanization to have a significant and substantial positive effect on physician price. Also, as hypothesized, the magnitude of the coefficient of LG was larger than that of MED for both procedures. However, when the regression equations include MED, LG, and P/P (equations 3), the statistical significance and the coefficients of MED and LG are substantially reduced; while LG remains positive, it is significant only at the 95% level for the obstetrical care procedure and is not significant for the appendectomy procedure. For both procedures, the coefficient of MED becomes negative. Thus, as hypothesized, MED and LG appear to be largely reflective of at least

some of the same factors revealed in the population per physician variable.

C. Structural Characteristics of the Production Unit

1. Source of income

The coefficients for the three variables indicating source of professional income (F/S, S/F, and S) varied in sign and magnitude and were almost always not statistically significant. To the extent that price and quality of medical care are positively related, these results do not support those who argue that continuation of the fee-for-service principle is necessary to maintain high quality of medical service.

2. Type of practice

The results indicate that the type of practice a physician is engaged in (solo, partnership or group) does not affect prices charged. For both procedures, the coefficients of PRT and GRP varied in sign and were never statistically significant price determinants. These results are similar to those found in the Steinwald and Sloan study which also used dummy variables to represent different practice sizes (solo, 2-5 MD's and more than 5 MD's) [14, 505].

D. Costs of Producing Medical Care

As hypothesized, the effect of total expenses (EXP) was always positive and statistically significant at the 99% level.

When the components of total expenses were tested, the following patterns emerged. For both procedures, malpractice insurance was consistently positive as hypothesized and significant at the 99% level. The coefficient of malpractice insurance ranged from .003 to .011 for the appendectomy procedure and from .015 to .016 for the obstetrical care procedure. The positive effect

of malpractice insurance on physician price is especially noteworthy in view of the recent steep increases in malpractice insurance rates.

For the appendectomy procedure, rent and non-medical professional expenses (legal, accounting, etc.) were also positive and typically significant at the 99% level; for the obstetrical care procedure these two cost components had positive signs but were only significant at the 90% level. All other expense components were not statistically significant for both procedures and carried signs that varied in no systematic pattern, with the exceptions that employees' wages and salaries, professional car, and drugs and medical supplies were consistently negative.

IV SUMMARY

This study has sought to identify and statistically test some of the determinants of physician pricing; these potential determinants were grouped into four categories: physician characteristics, demographic characteristics, structural characteristics of the production unit, and costs of producing medical care. The effects of these variables were tested via multiple linear regression analysis using individual physician data for two medical procedures, appendectomy and obstetrical care.

The empirical results indicate that both supply and demand variables have substantial impacts on physician fees. Among the physician characteristics, the degree of specialization and the sex of the physician were found to be important price determinants; however, the number of years of experience of the physician does not appear to influence price. All the variables tested that describe the area in which the physician practices were found to affect the fee charged. As expected, both the per capita income and the degree of urbanization generally had positive effects on price. However, population per physician was found to have a significant negative effect on price; this

result has been reported in another study and provides some additional support for the target income theory of physician pricing.

Neither of the sets of variables describing the structure of the physician's practice (source of professional income and type of practice) was found to significantly or consistently influence price.

Finally, the analysis indicates that the level of total expenses incurred in providing medical care has a positive and significant effect on fee, as does the malpractice insurance cost component.

Table 1
Variable Means and Standard Deviations

Procedure:	Obstetrical Care	Appendectomy
Variables		
FEE	199.50 (61.40)	198.04 (53.79)
INC	2883.97 (431.49)	2915.06 (421.66)
P/P	956.46 (495.00)	917.91 (464.59)
EXP	24.91 (18.88)	24.10 (19.82)
PSP	0.31 (0.46)	0.45 (0.50)
OSP	0.06 (0.23)	0.10 (0.30)
SX	0.02 (0.13)	0.01 (0.08)
MED	0.28 (0.45)	0.28 (0.45)
LG	0.43 (0.50)	0.46 (0.50)

Numbers in parentheses are standard deviations.

Table 2
Correlation Matrices

	INC	P/P	EXP	FEE	PSP	OSP	SX	MED
P/P	-.41							
	-.40							
EXP	-.06	-.05						
	-.01	.01						
FEE	.37	-.57	.10					
	.40	-.43	.10					
PSP	.14	-.35	-.13	.60				
	.17	-.32	-.12	.28				
OSP	-.01	-.05	.11	-.04	-.17			
	-.02	-.10	.002	-.003	-.31			
SX	-.06	-.07	-.04	.01	.03	.02		
	-.02	-.02	-.04	-.08	.01	.04		
MED	-.08	-.15	.01	-.09	.003	.03	-.01	
	-.09	-.09	-.01	-.13	.015	.06	-.01	
LG	-.40	-.70	.05	.54	.29	-.07	.07	-.54
	.37	-.72	.01	.43	.24	.04	.01	-.57

The top number refers to the obstetrical care procedure and the bottom number refers to the appendectomy procedure.

Table 3
Regression Coefficients

Procedure:	Obstetrical Care			Appendectomy		
Equation Number:	1	2	3	1	2	3
Dependent Variables						
INC	.02**	.02**	.02**	.03**	.03**	.03**
	(5.72)	(5.03)	(4.80)	(7.28)	(7.06)	(6.72)
P/P	-.04**		-.02**	-.03**		-.03**
	(-10.60)		(-2.52)	(-6.96)		(-2.42)
EXP	.41**	.40**	.40**	.32**	.31**	.32**
	(4.72)	(4.62)	(4.68)	(3.54)	(3.44)	(3.54)
PSP	64.25**	63.70**	62.88**	18.27**	19.36**	18.38**
	(16.78)	(16.96)	(16.75)	(4.49)	(4.82)	(4.57)
OSP	11.25	13.17*	12.71*	5.08	7.19	6.25
	(1.58)	(1.88)	(1.82)	(0.81)	(1.16)	(1.01)
SX	-14.30	-15.98	-15.82	-55.91**	-53.36**	-56.66**
	(-1.28)	(-1.34)	(-1.34)	(-2.44)	(-2.34)	(-2.49)
MED		19.60**	-.62		8.82*	-12.74
		(4.47)	(-.07)		(1.76)	(-1.25)
LG		51.96**	25.07*		35.26**	5.63
		(11.57)	(2.16)		(7.09)	(0.43)
$\tilde{R}^2$	.54	.56	.57	.28	.29	.30
Intercept	139.32	81.87	125.86	112.77	68.75	119.16

*Statistically significant at the 95% level.
**Statistically significant at the 99% level.
Numbers in parentheses are t-values.

FOOTNOTES

1. Some returned questionnaires were eliminated from consideration because they either lacked complete or consistent answers or were returned by physicians who were retired or engaged in federal service.
2. The obstetrical care procedure includes antepartum care, obstetrical delivery and postpartum care (with or without low forcepts, and for episiotomy).
3. The obstetrical care and appendectomy procedures were selected primarily for their uniformity; other possible procedures (such as initial office visit or follow-up hospital visit) were not selected because it was assumed that the fees for these would vary greatly among patients with different "special circumstances", and therefore only a small part of their total price variation could be explained by the variables for which data was available.
4. Measuring the dependent variable by the average price a physician charges a patient of middle income may introduce a bias since physicians' ideas of what constitutes middle income may vary among physicians. Measuring price in this manner was presumably undertaken in an attempt to arrive at a single price for every procedure each physician performs. However, it is often assumed that at least some physicians engage in price discrimination according to the patient's ability-to-pay.
5. Although it would have been desirable to include specialty board certification as a measure of the quality of the physician's degree of specialization, the data set did not allow this. However, since most patients are probably more likely to be aware of a physician's specialty than his certification status in the specialty, lack of board certification data may not be important. But for those procedures (such as surgical ones)

where the choice of the physician to perform the procedure is likely to be based to some degree on another physician's referral, the certification status of the physician may be expected to a more important determinant of the demand for a physician and consequently the price of his services; this, of course, is the case only if physicians do consider specialty board certification in making referral recommendations.

6. No data was available to measure the extent to which experienced physicians keep informed of new medical knowledge by attending professional meetings, reading medical journals, and so forth. Similarly, no data was available to measure the quality of the physician's services by the medical school attended or by the physician's class ranking while attending medical school or during the internship or residency programs.

7. For three recent surveys indicating that patients, as a whole, prefer male to female physicians, see references 4, 10 and 16.

8. However, while income is often an appropriate measure of a person's ability-to-pay, the extent of an individual's medical insurance coverage is often a better measure, especially for those procedures typically covered by major medical insurance. Nevertheless, measuring ability-to-pay by income may still be appropriate if an individual's medical insurance coverage is positively related to his income level.

9. The nine categories of county population are as follows. Non-metropolitan: less than 10,000; 10,000-24,999; 25,000-49,999; and 50,000 or more. Metropolitan: potential metropolitan; 50,000-499,999; 500,000-999,999; 1,000,000-4,999,999; and 5,000,000 or more.

10. The same holds for total expenses and its components, and, to a lesser degree for population per physician and degree of urbanization.

11. For further discussion of these results, see reference 1.

12. Newhouse also found a partial correlation coefficient of +.13 between dental prices and the number of dentists per person [13, 178].

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